DOOSAN Document Transmittal

Upper Trishuli-1 HEP (216MW)

Date	DT No.:	SHEET
2022-08-10	UT1-HEP-DHI-PC-D-0056	1 OF 1

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SUBJECT	Review Note RN-0214_Reinforcement Drawing of Diversion Tunnel Lining		

S. N.	REVIEW NOTE NO.	REVIEW STATUS	DWG. / DOC. NO.	REV.	DWG. TITLE / DOC. DESCRIPTION	REMARK
1	RN-0214	AN	UT1-C-010-CVL-DG-42006	0D	Reinforcement Drawing of Diversion Tunnel Lining	3 SHEET
2						
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12						

Received by :

Date :

Legend of Review Status
A : APPROVED
AN : APPROVED AS NOTED
RR : RETURN FOR RESUBMISSION
FI : FOR INFORMATION

DHI STAMP

Doosan Enerbility Co., Ltd
DOOSAN Enerbility
Branch Office Nepal

Issued by DHI

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Doosan Enerbility Co., Ltd.

Discipline : Civil

UPPER TRISHULI-1 HEP (216MW)

Client	**Nepal Water and Energy Development Company Private Limited**
Owner's Engineer	**Joint Venture of Tractebel Engineering GmbH & Jade Consult**

REVIEW NOTE

Contractor	**Doosan Enerbility**		
Title of the Document	Reinforcement Drawing of Diversion Tunnel Lining		
Document/Drawing No.	UT1-C-010-CVL-DG-42006	Revision	0D
Date of Documents/Drawings	02.08.2022	Received Date	02.08.2022
Transmittal Form No.	UT1-HEP-DHI-D-0331		
Previous Review Date/Status	16.07.2022/RR	Prev. Review Note No.	RN-0182
Review Note No.	**RN-0214**	**Present Review Date**	**10.08.2022**
		Present Review Status	**AN**

A: Approved AN: Approved as Noted RR: Returned for Resubmission FI: For Information, only

Comments to the reinforcement drawings of the Diversion Tunnel concrete lining under this revision are given in red in attached drawings (two sheets).

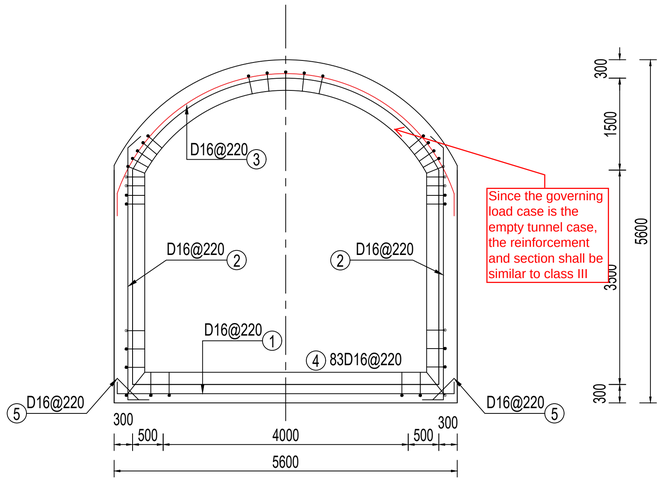
DISCLAIMER

Any approval will not release the Contractor from any of his obligations under the Contract. Despite the Engineer's approval the Contractor remains fully responsible for design, calculation, dimensioning, supply and installation without limitations.

Dr. Subin Desar (Structural Engineer)

Typical Cross Section D1/D2
(for rock class I&II&III)

SCALE 1:50



Rebar List of Lining Per Meter

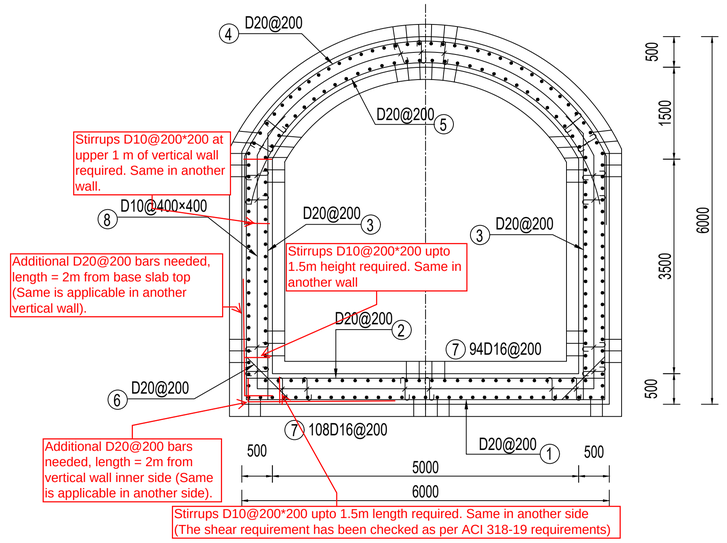
NO.	SHAPE (mm)	DIAMETER (mm)	LENGTH (mm)	NUMBER	TOTAL LENGTH (m)	REMARKS
①	415 — 5450 — 415	D16	6280	4.5	28.26	
②	415 — 3825 — θ=145° — 640	D16	4880	9	43.92	
③	240, 7210, θ=142°, R=2908, 240	D16	7690	4.5	34.61	
④	1000	D16	1000	83	83.00	
⑤	640	D16	640	9	5.76	

BOQ of Lining Type D1 (Per Meter)

LINING TYPE	Diameter (mm)	Total length (m)	Unit weight (kg/m)	Total weight (kg)	Summation (kg)
D1	D16	195.55	1.580	308.97	308.97
	Concrete: 5.76 m³				

Typical Cross Section D3
(for rock class III)
(for chainage 06.000 to 020.000)

SCALE 1:50


4 D20@200
D20@200 5
Stirrups D10@200*200 at upper 1 m of vertical wall required. Same in another wall.
D10@400×400
8
D20@200 3
D20@200 3
Stirrups D10@200*200 upto 1.5m height required. Same in another wall
Additional D20@200 bars needed, length = 2m from base slab top (Same is applicable in another vertical wall).
D20@200 2
7 94D16@200
D20@200 6
7 108D16@200
D20@200 1
Additional D20@200 bars needed, length = 2m from vertical wall inner side (Same is applicable in another side).
500
5000
500
6000
Stirrups D10@200*200 upto 1.5m length required. Same in another side
(The shear requirement has been checked as per ACI 318-19 requirements)
500
1500
3500
500
6000

This shall be applicable to the water side only. The cover on the rock side could be 50mm. Adopting higher cover on both sides would reduce the section strength drastically.

Rebar List of Lining Per Meter

NO.	SHAPE (mm)	DIAMETER (mm)	LENGTH (mm)	NUMBER	TOTAL LENGTH (m)	REMARKS
①	4030 — 5850 — 4030	D20	13910	5	69.55	
②	380 — 5850 — 380	D20	6610	5	33.05	
③	380 — 4340 — θ=145° — 400	D20	5120	10	51.20	
④	1000, 7260, θ=130°, R=3258, 1000	D20	9260	5	46.30	
⑤	800, 6320, θ=125°, R=2908, 800	D20	7920	5	39.60	
⑥	990	D20	990	10	9.90	
⑦	1000	D16	1000	200	200.00	
⑧	130 — 350 — 130	D10	610	120	73.20	

The stirrups size needs to be different for base slab and walls

BOQ of Lining Type D3 (Per Meter)

LINING TYPE	Diameter (mm)	Total length (m)	Unit weight (kg/m)	Total weight (kg)	Summation (kg)
D3	D20	249.60	2.470	616.51	977.67
	D16	200.00	1.580	316.00	
	D10	73.20	0.617	45.16	
	Concrete: 9.96 m³				

SCALE 1:50 0 0.5 1 1.5 2 2.5m

NOTE

1. Elevations,chainages are measured in meter,diameter and spacing of rebar are millimeter, dimensions are in millimeter unless otherwise specified.
2. The thickness of concrete cover is 75mm for side walls and roof, 150mm for invert unless otherwise specified.
3. Concrete faces of construction joints shall be roughed appropriately.
4. Symbol description: Rev.0D
   D denotes deformed bar, yield strength of the deformed bar is 500MPa.
5. Anchorage length of rebar shall be not less than 40 times of the reinforcement diameter, and lap length of rebar is 50 times of the reinforcement diameter.

REFERENCE DRAWINGS

UT1-C-010-CVL-DG-42001	Arrangement drawing of diversion tunnel
UT1-C-010-CVL-DG-42005	Outline drawing of diversion tunnel lining
UT1-C-010-CVL-DG-42008	Outline drawing of diversion tunnel tower of diversion tunnel

SYMBOL AND LEGEND

FOR APPROVAL

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REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
0D	22.Jul,2022	AS RN-0182	Zhu T.Z.	K.J. KIM	Y.S. SON
0C	08.Jul,2022	AS RN-0149	Zhu T.Z.	K.J. KIM	Y.S. SON
0B	10.Jun,2022	SECOND ISSUE	Zhu T.Z.	K.J. KIM	Y.S. SON
0A	20.Mar,2022	FIRST ISSUE	Zhu T.Z.	K.J. KIM	Y.S. SON

PROJECT TITLE
Upper Trishuli-1 HEP (216MW)

OWNER
NWEDC NEPAL WATER AND ENERGY DEVELOPMENT CO. PVT. LTD.

OWNER'S ENGINEER
TRACTEBEL ENGIE jade CONSULT

CONTRACTOR
DOOSAN Enerbility

DRAWING TITLE
REINFORCEMENT DRAWING OF DIVERSION TUNNEL LINING

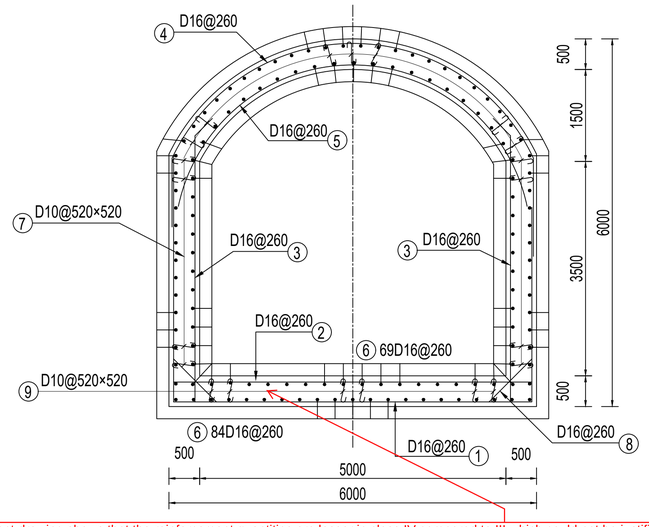
DRAWING NUMBER	SHEET NO.	REV. NO.
UT1-C-010-CVL-DG-42006	1 OF 2	0D

A1 (594 x 841 MM)

Typical Cross Section D3

(for rock class IV & concrete liner 500mm thick)

SCALE 1:50



The reinforcement drawing shows that the reinforcement quantities are lesser in class IV compared to III which could not be justified by the calculation. With reference to the submitted structural design report (UT1-C-010-CVL-DC-42005_0D Structural Calculation of DT Lining) also, the moment is higher in class IV with respect to Class III rock. The analysis from the SAP also shows slightly higher reinforcement requirement for class class IV. Hence, the reinforcement of class IV lining shall be at least equal to class III reinforcement as suggested by the consultant.

Rebar List of Lining Per Meter

NO.	SHAPE (mm)	DIAMETER (mm)	LENGTH (mm)	NUMBER	TOTAL LENGTH (m)	REMARKS
①	4030 — 5850 — 3230	D16	13110	3.8	49.82	
②	380 — 5850 — 380	D16	6610	3.8	25.12	
③	380 — 4340 θ=145° — 240	D16	4960	7.6	37.70	
④	7260, 800, 1600, θ=130° R=3258	D16	9660	3.8	36.71	
⑤	640, 6320 θ=125° R=2908, 640	D16	7600	3.8	28.88	
⑥	1000	D16	1000	153	153.00	
Rev.0D ⑦	130 — 350 — 130	D10	610	96	58.56	
⑧	640	D16	640	7.6	4.86	
Rev.0D ⑨	130 — 275 — 130	D10	535	20	10.70	

BOQ of Lining Type D3 (Per Meter)

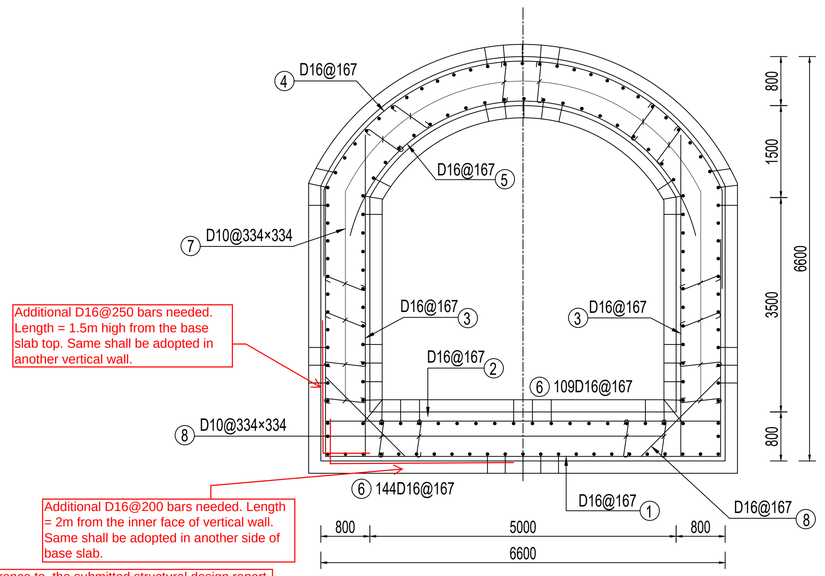
LINING TYPE	Diameter (mm)	Total length (m)	Unit weight (kg/m)	Total weight (kg)	Summation (kg)
D3	D16	336.09	1.580	531.02	573.75 Rev.0D
	D10	69.26	0.617	42.73 Rev.0D	
	Concrete: 9.96 m³				

Typical Cross Section D4

(for intersection of headrace and diversion tunnel)

CHAINAGE D0+175.039~ D0+195.039

SCALE 1:50



Rebar List of Lining Per Meter

NO.	SHAPE (mm)	DIAMETER (mm)	LENGTH (mm)	NUMBER	TOTAL LENGTH (m)	REMARKS
①	4400 — 6450 — 3600	D16	14450	6	86.70	
②	6280	D16	6280	6	37.68	
③	4780	D16	4780	12	57.36	
④	8070, 800, 1600, θ=130° R=3558	D16	10470	6	62.82	
⑤	640, 6320 θ=125° R=2908, 640	D16	7600	6	45.60	
⑥	1000	D16	1000	253	253.00	
⑦	130 — 650 — 130	D10	910	120	109.20	
⑧	130 — 575 — 130	D10	835	45	37.58	
⑨	640	D16	640	12	7.68	

BOQ of Lining Type D4 (Per Meter)

LINING TYPE	Diameter (mm)	Total length (m)	Unit weight (kg/m)	Total weight (kg)	Summation (kg)
D4	D16	550.84	1.580	870.33	960.89
	D10	146.78	0.617	90.56	
	Concrete: 16.79 m³				

SCALE 1:50 0 0.5 1 1.5 2 2.5m

NOTE

1. Elevations,chainages are measured in meter,diameter and spacing of rebar are millimeter, dimensions are in millimeter unless otherwise specified.
2. Other notes please refer to the sheet 1.

REFERENCE DRAWINGS

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